

Emerging Literacy Through Assistive Technology

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In schools today, literacy is taking on an ever-increasing role. Children as young as 3 years old are participating in a variety of literacy activities. Emergent literacy focuses on oral language, early experiences with print, picture books, and writing (see box, "What Is Emergent Literacy?").

In addition, many fascinating, helpful technological tools are increasingly available to provide motivation, prompts, and other assists for new readers (see box, "How Can Technology Help?"). This article shows how preschool children developed literacy skills by using technology.

In a recent study, I examined how assistive technology affected emergent literacy in a preschool classroom for students with multiple disabilities. This case study of a group of students examined the children's ability to participate in literacy activities using a variety of assistive technology devices throughout the school day.

Case Study

The Preschool Education Program is a preschool setting for noncategorically grouped children who have been diagnosed with developmental delays in the areas of visual reception, speech and language (receptive and expressive), fine motor, and gross motor. The class examined for this case study had ten 3-year-old children. The children attended school for 2.5 hours per day, 5 days a week. All children had individualized

education programs (IEPs) with learning goals and objectives based on needs identified through formal and informal testing. The goals and objectives serve as guides to assist the staff to help each child acquire skills. Many of the children received related services, such as speech and language, occupational, and/or physical therapies.

Using Technology

The children used the following types of assistive technology in the classroom:

- Picture Communication Symbols (key vocabulary related to the book or theme of the week).
- Adapted books, used at circle time and placed in the reading corner.
- A BIGmack—a single-message communication device, programmed to repeat a story's line.
- A computer with Intellikeys, Intellipics (1997-2000), and Overlay Maker, alternative keyboard and software.

We used a case-study method to determine how these different types of assistive technology can increase emergent literacy skills. To collect data throughout the school day, we used observations, anecdotal data, and checklists.

In addition to the assistive technology listed previously, the teachers often used aided language stimulation as an augmentative communication strategy throughout many activities. Aided language stimulation is used with a facilitator who highlights symbols on the

What Is Emergent Literacy?

Emergent literacy is concerned with the early phases of literacy development, the period between birth and the time when children read and write conventionally. Emergent literacy has led to a conceptualization of learning as a continuous process that begins at birth and continues through oral language, early experiences with print, picture books, music, drawing, and writing (Gurry & Larkin, 1996). The term *emergent literacy* signals a belief that, in a literate society, even children as young as 1 and 2 are in the process of becoming literate (DeCoste & Glennen, 1997).

Children who are nonverbal and/or who have physical disabilities may have limited opportunities to learn to read, may have little interaction with others during literacy activities, and may be given fewer opportunities to read and write than their peers without disabilities. Technology-based literacy activities can provide modifications and adaptations that support children who are nonverbal and/or who have physical disabilities to be successful in their curriculum and instruction.

user's communication display as he or she interacts and communicates verbally with the user (Beukelman & Mirenda, 1998). King (1999) discussed the practical, user-friendly aspects of AT operation and use for any given device, for

How Can Technology Help with Emergent Literacy?

Assistive technology (AT) is defined as any item, piece of equipment, or product system, whether acquired commercially off the shelf, modified, or customized, that is used to increase, maintain, or improve functional capabilities of individuals with disabilities (Technology Act of 1988). Assistive technology provides support for individuals who have sensory, motor, cognitive, and/or linguistic challenges. Assistive technology allows for or enhances the participation of children and adults in many of the daily activities that many take for granted such as speaking, writing, listening, seeing, eating, drinking, moving around one's home or community, using the telephone or computer, opening and closing doors, and turning lights on and off.

Assistive technology encompasses a range of devices from low to high tech:

- *High-tech* systems refer to microcomputer components, including hardware and software, and allow for storage and retrieval of message information.
- *Low-tech* communication systems are nonelectronic or use electronic components that are not computer based. Picture communication boards, alphabet boards, and eye gaze boards are examples of low-tech nonelectronic systems. Light pointers, clock communicators, and switch-activated tape recorders are examples of low-tech electronic systems (DeCoste & Glennen, 1997).

In the classroom, assistive technology is used to increase, maintain, or improve functional capabilities of students with disabilities.

example, Boardmaker (1997-2000) by Mayer Johnson. Researchers often refer to *transparent technologies*, which conveys that a given system or device is "user-friendly" to understand and operate.

Daily Activities

The daily routine in the classroom provided many opportunities for emergent literacy skills to emerge. For "Hello" circle, the teacher posted a picture communication symbol schedule on the board directly in front of the children (Figure 1). The use of daily picture communication schedules, a picture symbol and word combined, was a visual strategy that provided students an opportunity to read. Many children were able to receptively and expressively identify the picture. Associating the picture symbol and word together exposed the children to print.

Language Time

Another opportunity to use assistive technology in preliterate activities occurred during "Language" circle. The special education teacher used an age-appropriate thematic approach to learning as a basis for curriculum that supported the achievement of student IEP goals. Within each unit, the teacher used developmentally-appropriate materials. For example, the teacher read the

book, *Brown Bear, Brown Bear What Do You See?*, every day for at least one week. The repeated line "Brown Bear, Brown Bear What Do You See?" was programmed into a BIGmack for a child who was unable to actively participate in reading along with the book. This allowed the child to participate with the group by activating the switch.

Teachers and other professionals adapted books used in the class with Picture Communication Symbols to simplify the original text. Using Boardmaker, the special education teacher and the speech language pathologist created storyboards that correspond to books read in the classroom. The teacher then placed these storyboards in the reading corner, and the children have an opportunity to read the books independently. Through anecdotal data taken by the special education teacher, the students demonstrated their ability to independently explore the books and gain information from the pictures about the text.

Another emergent-literacy activity that has been integrated into the curriculum is matching vocabulary, a picture symbol paired with the word. The same Picture Communication Symbols that were used to adapt storyboards are also part of an individualized activity. The child is asked to match,

The daily picture communication schedules, a picture symbol and word combined, was a visual strategy that provided students an opportunity to read.

point to, and name each symbol. A teacher-made checklist was used to collect data on the progress of both student receptive and expressive knowledge of the symbols.

Creating New Learning Centers

Intellipics and Overlay Maker are software programs that can be used to create computer-based adapted books. Using Intellipics and Overlay Maker, the special education teacher recreated each page of a book. Each page of the computer-based book contained a different graphic, sound, and movement that corresponded to the book. The computer-based book then became a "center." Each day, four different centers were available for the children to play. After "Language" circle, each child chose where he or she wanted to work or play. One child was allowed at the computer at a time. Only one child went to the computer at a time, because they had a difficult time sharing the mouse. A timer was set for 5 minutes. Once the timer went off, the child knew he or she was finished and moved to another center.

The teacher designed a rubric to assess each child using an Intellipics activity on the computer (Table 1). The rubric includes four criteria for collecting data with each activity.

Children Learning

Word/Picture Recognition

During the past school year, the speech language pathologist conducted observations while the special educator conducted "Hello" circles. At the beginning of "Hello" circle, the picture communication schedule is reviewed by reading each sentence aloud and pointing to the picture symbol of the activity (Figure 1). pathologist had noted in her observa-

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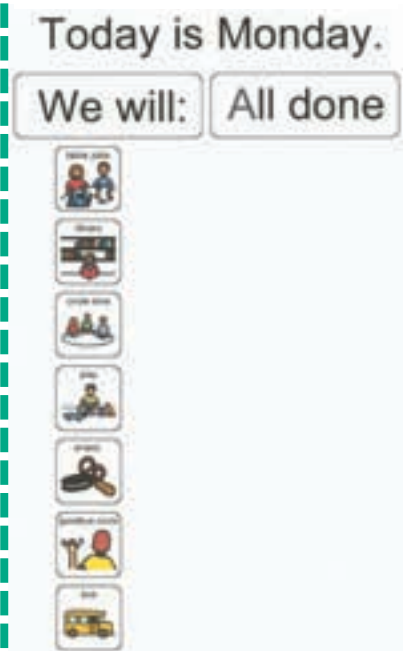
tion that some of the children were able to pair the picture with the word and read the entire schedule independently.

After the picture schedule is reviewed, the first picture on the schedule was to sing "Hello" to each child. Here was another opportunity for children to read their names on the school bus and to identify their own name (Figure 2). At the beginning of the school year, each child's name was paired up with a symbol. After winter break in December, the symbol that was paired up with each name was removed. Again, the same children who were able to read the daily schedule with Picture Communication Symbols were able to identify their name on the bus without the aid of the symbol. The children who were unable to identify their name without the symbol were given a choice of two names, their name and a peer's name. After 3 consecutive days of being presented with a choice of two names, all the children were able to independently identify their name without the symbol.

Adapted Books

Using Intellipics, an electronic book of *Brown Bear, Brown Bear What Do You See?* was prepared ahead of time (Figure 3). With an electronic book, the child has the opportunity to activate a single switch that takes him or her through independent reading of an entire book. As the child activates the single switch, the program will turn a page from the book on the screen, speak the text, and a story illustration will move on the screen. As the Intellipics program was introduced to the children, they appeared very excited to use the computer as another tool for learning. They had other opportunities to work on the computer—using teacher-made developmentally age-appropriate templates and other preschool software. Kid Pix Deluxe, Chicka Chicka Boom Boom, The Cat in the Hat, The Backyard, Preschool Jumpstart, and Bailey's Book

Figure 1. Picture Communication Symbols



House are some of the software programs used in the classroom.

The teacher observed the children as they maneuvered through each story. It was noted how they were able to activate the single switch to turn each page of the book. Children interacted with the books in different ways. Some of the children were repeating what they heard from the text and some were predicting what was going to happen next. One child enjoyed hitting the single switch and watching each page come on the screen. Attempts were made to slow this child down by asking various questions regarding each page to make his learning more meaningful and interactive. This reading activity not only provided independent access, but also allowed for repeated readings.

The children interacted differently with the books on the computer and the lower tech adaptations of the book with the picture communication symbols and

Children using the assistive technology were able to pursue reading at their own speed and to choose computer-based books if they wished.

the BIGmack. For some children, it was easier to sit in a chair or on a pillow and read a book, actively interacting with the symbols. These children needed verbal and some physical prompts when turning the pages.

Two children were not interested in the book with accompanying symbols, but only wanted to use the computer. They appeared to be very knowledgeable about computers. Phone calls were made to both families and they reported their children spend some time each day working and/or playing on the computer. They attempted to read along with the spoken text. After the spoken text, the children repeated what they heard.

Rubric Evaluations

The teacher used the rubric with each child during center time to assess the four criteria. Out of 10 children, 9 were able to independently activate the single switch. One child needed a verbal prompt to activate the switch. Four children independently pointed to all the picture symbols. Four children required a verbal prompt, "Where is the ___?" to complete the task. Two children were

Figure 2. Name/Symbol Pairing

Alyssa	
Joanna	
Dante	
Johnny	
Sean	
Mecca	
Kevin	
Shawn	
Julia	
Ishiah	
Benjamin	
Justin	

Table 1. Intellipik Rubric

Scale/ Elements	Criterion 1	Criterion 2	Criterion 3	Criterion 4
	Activate the switch	Receptively identify (point to) picture communication symbol(s) on each page of activity	Expressively identify (name) picture communication symbol(s) on each page of activity	Repeat spoken text
5	Independently activated switch to every page and listened to spoken text throughout the book	Receptively identified 10/10 pictures throughout the book	Expressively identified 10/10 pictures throughout the book	Repeated the color, picture, and all of the words of the repeated line
4	Independently activated switch 5/10 pages and listened to spoken text throughout the book	Receptively identified 8/10 pictures throughout the book	Expressively identified 8/10 pictures throughout the book	Repeated the color, picture, and any 3 words of the repeated line
3	Verbal prompt to activate switch throughout the book	Receptively identified 6/10 pictures throughout the book	Expressively identified 6/10 pictures throughout the book	Repeated the color and picture on each page of the book
2	Hand over hand assistance to activate switch throughout the book	Receptively identified 4/10 pictures throughout the book	Expressively identified 4/10 pictures throughout the book	Repeated the color of each picture on each page of the book
1	Student activated switch to turn each page and did not listen to spoken text throughout the book.	Did not receptively identify any pictures throughout the book	Did not expressively identify any pictures throughout the book	Did not repeat any spoken text throughout the book

unable to receptively identify the picture symbols presented in the Intellipics activity. Three children independently named all the picture symbols. Five children required a verbal prompt, "What is this?" to complete the task. Two children were unable to expressively identify the picture symbols. Two children repeated the entire spoken text on each page of the Intellipics activity. Four children repeated most of the spoken text. Four children did not attempt to repeat the spoken text.

Implications for the Classroom

Integrating assistive technology into emergent literacy activities appears to increase, maintain, or improve the skills necessary for reading.

- Teachers can use Intellipics to recreate books used for theme/unit books used at circle time.

- Because many children use the computer as another medium to develop emergent literacy skills, even very young children can work independently and make reading interactive.

It has been gratifying to hear the children reading the stories, commenting on the pictures, and retelling the story. Before the integration of Intellipics, the children were only looking at books at the reading corner. The children were flipping through a book as fast as they could to get another book. There was little interaction between the child and the book.

There were only two issues that arose during the implementation of the Intellipics activity of *Brown Bear, Brown Bear What Do You See?* At first, all the children wanted to work at the computer at the same time. The special education teacher and the instructional assis-

tant had to visually show the children on the computer center card that there was only one child allowed at the center at a time. It took a few weeks for the children to understand. When the special education teacher did not work one-on-one with a child at the computer for specific activities, peer groups were designed according to ability. These groups consisted of two children that facilitated socialization and cooperation.

The second issue involved the amount of time that each child wanted to use the computer. The solution—using a timer—was monitored either by

Adapted books can encourage children to interact with text and words.

Figure 3. Intellipic Adapted Book



the special education teacher or the instructional assistant when it went off to transition the child to another center in the classroom.

Final Thoughts

Both high- and low-tech assistive technologies provide opportunities for literacy development in the classroom. With the use of assistive technology, pre-school-aged children with disabilities are able to successfully participate in literacy activities.

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